REMARKS

Applicants respectfully request reconsideration of the above-captioned application. Claims 4, 5, 6, 13, 18, 19 and 21 have been amended to improve their readability, and claims 23 and 24 have been added to round out the scope of protection being sought.

The Office Action includes an objection to the title as not being sufficiently descriptive. The undersigned assumes that the Examiner would like the title to reflect that the claims include a method of forming an optical filter device. The title has been amended accordingly. In light of this change, Applicants respectfully request reconsideration and withdrawal of this objection.

The Office Action includes a rejection of claims 18, 19 and 21 under 35 U.S.C. §112, second paragraph, as allegedly being indefinite. This term appears only in claim 21 and therefore it is assumed that the Examiner intended only to reject claim 21 under 35 U.S.C. §112, second paragraph. Applicants also respectfully submit that the claim is sufficiently clear in its original form. Because the Examiner was unfamiliar with the term "dropwise" claim 21 has been amended to avoid this term but instead recite that additional liquid crystal is added onto the film.

The Office Action includes a rejection of claims 1-12 and 22 under 35 U.S.C. §102(b) as allegedly being clearly anticipated by the *Yoshinaga et al.* patent (U.S. Patent No. 5,316,806). This rejection is respectfully traversed.

The *Yoshinaga et al.* patent discloses an information memory medium which uses a ferroelectric chiral smectic phase of a polymeric liquid crystal as a recording layer. In voltages applied in a heated state to select a recorded state, followed by a cooling, so that

the recorded state can be kept according to the ferroelectric chiral smectic phase the media is subjected to heat via laser light to effect this phase. It is said that this speeds up the writing and rewriting process.

In structure, a substrate 1 is provided with a transparent electrode 2 and in an alignment control film 5 on top of a recording layer 3. As explained at column 13 beginning at line 62, a recording/erasing process comprises heating the recording layer aligned in a manner described above and making a polymerization in a given direction by means of a voltage applying device 7, followed by a cooling to effect initialization.

While applying a voltage reverse to the voltage for initialization, by means of a voltage applying device 7, a heating laser light 15 is applied to a selected recording area 16 as shown in Figure 1. Thereafter, a heating laser light 15 is removed, followed by a cooling. As a result, the recording area 16 has an arrangement of polymerization reversed to that of the initialization and is fixed. Hence, Applicants respectfully submit that the Office may have misinterpreted the meaning of Figure 1.

Figures 2A-2D show examples of grooves 6 made in the recoding layer. As explained in column 14 beginning at line 28, these grooves are used to form the liquid crystal in a spiral, for tracking purposes in the recording layer as it is conventional.

With respect to claim 1, Applicants respectfully submit that the *Yoshinaga et al.* does not disclose an optical filter device as disclosed and claimed. First, the undersigned does not understand what the Office is analogizing to an optical waveguide layer. While polymeric liquid crystal mentioned in the *Yoshinaga et al.* patent could be used as a filter element in a different context, this fact alone does not mean that the *Yoshinaga et al.* patent

suggest such a use in the context of the present invention. To the undersigned's reading, not only does the *Yoshinaga et al.* patent not include an optical waveguide layer, it does not appear to have a filter element including a liquid crystal layer disposed in a position which divides an optical waveguide layer in the waveguide direction, the liquid crystal layer having a twisted structure in which a helical pitch reflects light of a predetermined wavelength, such as recited in pending claim 1.

It is important to note that the present invention, as illustrated in Figure 1, for instance, is useful in an optical waveguide layer to filter two different wavelengths such as a wavelength of 1.55 μm such as used for video signal transmission, and separating out from it an audio signal having wavelength of, for instance, 1.3 μm. Neither this structure nor its purpose is taught or suggested in the *Yoshinaga et al.* patent.

If the undersigned has misunderstood the Office's rejection, he apologizes. Nevertheless, Applicants would appreciate a more thorough explanation of the rejection if it is to be continued.

Applicants respectfully submit that independent claims 12 and 22 also include distinguishing features mentioned above. For instance, claim 12 recites an optical waveguide layer on a substrate into which is formed a groove and a filter element in the groove wherein the filter element includes a liquid crystal layer disposed in a position which divides the optical waveguide layer in a waveguide direction. The liquid crystal layer, as recited in claim 12, has a twisted structure in which the helical pitch reflects light of a predetermined wavelength. Claim 22 is a method of forming an optical filter device which includes providing an optical waveguide layer on a substrate having a groove formed

therein and pouring the liquid crystal into the groove. The liquid crystal material is irradiated with ultraviolet waves such as the liquid crystal material exhibits a cholesteric phase whose helical axis is oriented in parallel with the waveguide direction of the optical waveguide layer. It is respectfully submitted that the *Yoshinaga et al.* patent does not teach or disclose these features in combination with the other recitation of claims 12 and 22.

The Office Action also includes a rejection of claims 1, 12, 18 and 22 as allegedly being anticipated by the *Sakawaka et al.* patent publication (JP-10282324). This rejection is respectfully traversed.

A copy of the patent abstract of Japan for this publication is attached hereto and listed on the enclosed form PTO-1449. This abstract was obtained from the Japanese Patent Office at www.jpo.go.jp.

As described in the abstract, a liquid crystal or chiral nematic liquid crystal is dropped into the light absorbing layer 2' and embedded in the recess formed in the light absorbing layer 2'. After heating, the liquid crystal apparently forms a light reflecting layer 5.

Applicants respectfully submit that other than forming a liquid crystal in the groove, there is no relation between the present invention and this applied art. Specifically, claim 1, for instance, recites a filter element disposed in a position which divides an optical waveguide layer in a waveguide direction. The liquid crystal layer has a twisted structure in which the helical pitch reflects light of a predetermined wavelength. It does not appear

to the undersigned that the *Sakakawa et al.* publication includes an optical waveguide layer. This distinction is also found in claims 12, 18 and 22.

Additional distinctions exist in these claims. For instance, claim 18 recites that placing a spacer material on a mirror-polished surface of the substrate, placing the ultraviolet curing liquid crystal material on the substrate adjacent to the spacer material and pressing the UV-transparent substrate on the ultraviolet curing liquid crystal to form a film. These features are not found in the Japanese patent publication.

In light of the above, Applicants respectfully request reconsideration and withdrawal of this rejection based on the *Sakakawa et al.* patent publication.

The Office Action also includes a rejection of claims 1-17 under 35 U.S.C. §103(a) as allegedly being unpatentable over the *Akins* patent (U.S. Patent No. 5,399,390). This rejection is also respectfully traversed.

In the rejection, the Office suggests that the *Akins* patent fails to meet the recitations of the claim and not disclosing a cholesteric liquid crystal being a polymer. In reviewing the claims, it does not occur to the undersigned that the Applicants had specifically claimed a polymer. The Office Action also suggests that the secondary references provided as evidence of the assertion regarding the characteristics of a polymer liquid crystal but no secondary reference is identified. Whether or not the characteristics of a polymer liquid crystal are accurately depicted in the rejection, Applicants respectfully submit that the rejection is not relevant to the claimed invention. In fact, it is assumed that this rejection was inadvertently included in the Office Action. The *Akins* patent further supports this understanding insofar as it merely discloses a liquid crystal display device having first and

second polymeric substrates 30 and 62 in the layer of cholesteric liquid crystal material disposed therebetween. As such, there appears to be little relevance to the present invention.

The Office Action includes a rejection of claims 1-17 under 35 U.S.C. §103(a) allegedly being unpatentable over the IBM technical disclosure NN860445000 in view of the *Davis et al.* patent (U.S. Patent No. 6,043,861) as well as a rejection of claims 1-17 under 35 U.S.C. §103 as allegedly being unpatentable over the *Stotts* patent (U.S. Patent No. 3,909,113) in view of the *Davis et al.* patent.

These rejections are similar to the one mentioned above insofar as they address features not being claimed in the present application. Further, the *Stotts* patent is directed to an optical coupler which includes a cholesteric liquid crystal material 11 formed in an optical path 10 as described at column 5. The optical path 10, as illustrated, appears to be a fiber optic cable and the liquid crystal material is chosen to be responsive to only one combination of selective wavelength of light energy to couple out a single particular sector wavelength of light through a cladding 12 which surrounds the optical path 10 with photo responsive means 13. As such, it does not appear to be relevant to the present invention particularly for failing to disclose an optical waveguide layer, groove formed therein, or a substrate, among other things.

The *Davis* patent is also directed to an optical waveguide, but is does not appear to the undersigned to be at all relevant to the present invention. Nor would the asserted modification of the *Stotts* patent have any effect on the analysis given above.

With respect to the IBM technical disclosure bulletin, it is noted that this article merely goes to a single mode fiber. Another figure was provided by the Patent Office. It is believed that the described structure is significantly different than the *Stotts* patent. In light of the apparent distinctions between *Akins* patent, the *Stotts* patent, the IBM technical disclosure bulletin and the commentary attached thereto which do not relate to features claimed in the present set of claims, Applicants can only assume that these rejections were inadvertently included in the Office Action.

In light of the apparent distinctions between *Akins* patent, the *Stotts* patent, the IBM technical disclosure bulletin and the commentary attached thereto which do not appear to relate to features claimed in the present set of claims, Applicants assume that these rejections were inadvertently included in the Office Action,

The Office Action also includes a rejection of claims 18-21 under 35 U.S.C. §103(a) as allegedly being unpatentable over the *Fan* patent (U.S. Patent No. 6,106,743) in view of *Kawasumi et al.* (U.S. Patent No. 5,978,065), the *Kato et al.* (U.S. Patent No. 6,011,609 and the *von Gutfeld* (U.S. Patent No. 6,055,035).

The Office suggests that lacking from the *Fan* patent is a mirror application liquid crystal before applying the upper substrate. These features are not found in the present application. The *Fan* patent relates to structurally ordered articles which utilizes intrinsic self-assembling or lining process of liquid crystal molecules. As with the foregoing rejections mentioned above, the commentary accompanying this rejection does not appear to relate to the present invention, particularly since it mentions such things as an upper substrate. As such, and after reviewing the various prior art documents, it does not appear

that the rejection is particularly directed to the presently claimed invention. Accordingly, Applicants respectfully request withdrawal thereof.

The *von Gutfeld* patent relates to a method and apparatus for filling liquid crystal display panels which appears to be a spraying process with a scanning arm. The *Kawasumi et al.* patent is directed to a liquid crystal device and a method of manufacturing it that includes dropping a liquid crystal on one substrate and applying a top substrate. The *Kato et al.* patent also deals with manufacturing an LCD which involves dropping liquid crystal onto a substrate and then pressing an upper and lower substrate and involves a spacer material. While peripherally similar to the present invention, as manufacturing steps involving a liquid crystal material, any combination of these references does not teach or the suggest the irradiating ultraviolet curing liquid crystal with ultraviolet rays through a UV-transparent substrate which is pressed upon the ultraviolet curing liquid crystal to form a film adjacent to spacer material which has been placed on the substrate having a mirror-polished surface. Further, none of them recites features in the dependent claims such as claim 19's step of peeling off the film from the substrate or cutting the film with the substrate. Further, it does not appear in any of the reference teaches adding an additional layer of liquid crystal on the film.

In light of these distinctions, Applicants respectfully request reconsideration and withdrawal of this rejection.

As a minor note, the PTO-892 includes mention of the *Masazumi et al.* patent, but lists the patent number of a different patent. (The listed patent number corresponding to a patent issued to *Johnson* which deals with a dual strap system for a conversion of

backpack.) Applicants note this only in passing insofar as there appears to be an error in the notation of the number.

In light of the foregoing, Applicants respectfully request reconsideration and allowance in the present application. Should any residual issues exist, the Examiner is invited to contact the undersigned at the number listed below.

Respectfully submitted,

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Attachment to Amendment
Mark-Up of the Specification

Paragraph beginning at Page 4, line 11

--As a method of selectively reflecting light of a predetermined wavelength and transmitting light of another wavelength, usually, an interference effect of a thin film is employed. A liquid crystal exhibiting a cholesteric phase, particularly, a chiral nematic liquid crystal, configured by adding a chiral agent to a nematic liquid crystal has such a reflection characteristic. A liquid crystal of this kind selectively reflects light of a wavelength corresponding to the helical pitch of liquid crystal molecules as shown in expressions (1) and (2) below (circular dichroism).--

Paragraph beginning at Page 5, line 9

--A video signal of a wavelength of 1.55μm and an audio signal of a wavelength of 1.3μm are superimposed and input from the direction of the arrow A to the optical waveguide layer 2. The video signal is selectively reflected by the filter element 5 to be emitted in the direction of the arrow B. The audio signal is transmitted through the filter element 5 and then impinges on the photodiode 11 in the direction of the arrow C. On the other hand, an audio signal of a wavelength of 1.3μm is supplied from the laser diode 12 from the direction of the arrow D, and then transmitted through the filter element 5 in the direction of the arrow D, and then transmitted through the filter element 5 in the opposite direction, to be emitted in the direction of the arrow A'. The separation of the paths according to wavelength is because ϕ_2 (signifying the angle [between the line

Attachment to Amendment
Mark-Up of the Specification

interconnecting points A and C with the line intersection point B and the filter 3] at which the video signal input from the direction of the arrow A is reflected by the filter element 5 to be emitted in the direction of the arrow B) is relatively large. It is large enough that the 1.3 μm wavelength light coming from the laser diode 12 goes in the direction of arrow A' and not toward arrow B. [However] While, because ϕ_1 of Figure 1 is relatively small, [the 1.3 μm signal can go] the audio signal input from the direction of the arrow A and transmitted through the filter element 5 can go not only to the laser diode 12 but also to the photodiode 11.--

Attachment to Amendment
Mark-Up of Claims 4-6, 13, 18, 19 and 21

4. (Amended) An optical filter device according to claim 1, wherein said liquid crystal layer is formed by stacking a [right-handed twist] clockwise polarized layer and a [left-handed twist layer] counterclockwise polarized layer.

5. (Amended) An optical filter device according to claim 2, wherein said liquid crystal layer is formed by stacking a [right-handed twist] clockwise polarized layer and a [left-handed twist layer] counterclockwise polarized layer.

6. (Amended) An optical filter device according to claim 3, wherein said liquid crystal layer is formed by stacking a [right-handed twist] clockwise polarized layer and a [left-handed twist layer] counterclockwise polarized layer.

13. (Amended) An optical filter device according to claim [11] 12, further including a photo diode, a laser diode, and a monitor photo diode on the silicon substrate.

18. (Amended) A method of producing an optical filter element, wherein said filter element includes an ultraviolet curing liquid crystal layer having a twisted structure in which a helical pitch after curing reflects light of a predetermined wavelength, said method comprising:

providing a substrate;

Attachment to Amendment
Mark-Up of Claims 4-6, 13, 18, 19 and 21

placing a spacer material on a mirror-polished surface of said substrate; [and]

placing said ultraviolet curing liquid crystal material on said substrate adjacent to said spacer material;

pressing a UV-transparent substrate on said ultraviolet curing liquid crystal material to form a film; and

irradiating said ultraviolet curing liquid crystal material with ultraviolet rays.

19. (Amended) A method according to claim 18, further comprising cutting said film into a given size; and peeling said film off from said substrate.

21. (Amended) A method according to claim 19, further comprising adding an additional layer of liquid crystal film on said film, before said curing step, including adding [dropwise] additional liquid crystal onto said film.